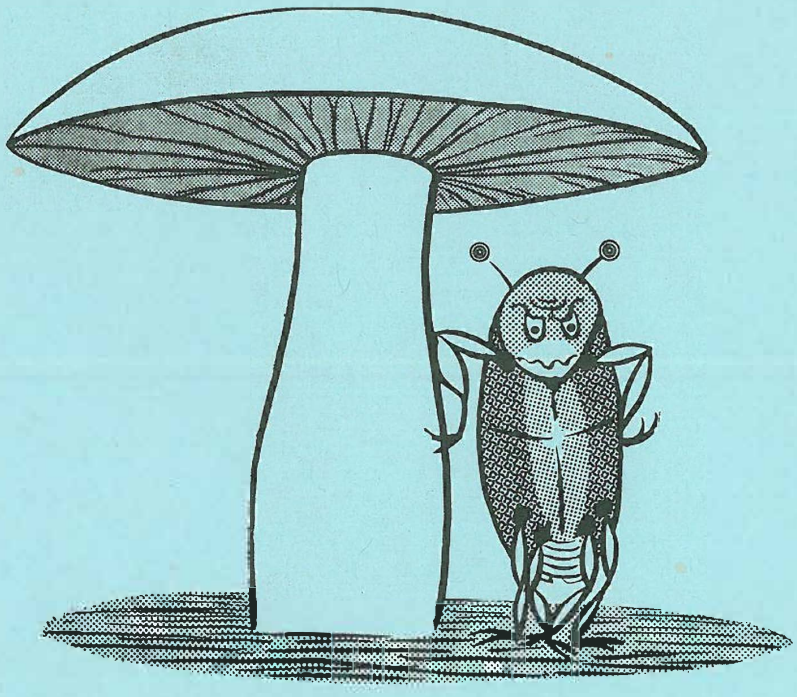
MONTANA
FOREST PEST CONDITIONS
AND PROGRAM HIGHLIGHTS
1984



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Montana Department of State Lands
Division of Forestry

MONTANA FOREST PEST CONDITIONS AND PROGRAM HIGHLIGHTS

1984

Compiled by:

Steve Kohler
Oscar J. Dooling
Wayne E. Bousfield

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U. S. Department of Agriculture
Forest Service, Northern Region
Cooperative Forestry & Pest Management
P. O. Box 7669
Missoula, Montana 59807

Montana Department of State Lands
Forestry Division
Forest Insect & Disease Section
2705 Spurgin Road
Missoula, Montana 59801

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INTRODUCTION

This report is the fifth since the adoption of a new format covering forest insect and disease conditions on all ownerships (Federal, State, and private) on a State-by-State basis. It has been prepared jointly by the Montana Department of State Lands, Forestry Division, and the USDA Forest Service, Cooperative Forestry and Pest Management. A similar report for Idaho has been prepared by the Idaho Department of Lands and the USDA Forest Service.

This report provides a historical record of insect and disease outbreaks in Montana's forests. It also provides a summary of results of projects underway to decrease losses from some of these pests, estimates of resource losses, and the severity and magnitude of current damage.

SUMMARY OF CONDITIONS

Mountain pine beetle was the most destructive forest insect on lands of all ownerships in Montana again in 1984. Federal acres of all host species infested totaled 852,301. Infestations on State and private lands covered 450,833 acres. Spruce beetle infestations decreased for the first time since the current outbreak began in 1981. Damage by Douglas-fir beetle on all ownerships continued to increase. Western balsam bark beetle damage continued to be chronic in stands of subalpine fir. Tree killing from the pine engraver declined considerably. No major damage from other bark beetles was noted. There was a slight decrease in acres of aerially visible defoliation caused by western spruce budworm on all ownerships with a total of just over 2.3 million acres recorded. Adult male moth catches of Douglas-fir tussock moth declined substantially on most of the 33 permanent pheromone trapping plots in western Montana. For the second year, visible larch casebearer defoliation increased in chronically infested areas. Larch budmoth defoliation continued along the Mission Mountains. Defoliation by the pine needle sheathminer was widespread over Montana during 1984. Pine butterfly populations decreased, with no visible defoliation detected. Gypsy moth pheromone-baited traps were placed in 60 locations, but only one moth was caught at Apgar Campground in Glacier National Park. Western pine shoot borer remained a chronic pest in ponderosa pine plantations. The fall webworm outbreak collapsed. Little damage by pine bark aphids was reported on Scotch pine Christmas tree plantations. About 130 acres of curlleaf mahogany were defoliated by western tussock moth on Bureau of Land Management (BLM) lands near Twin Bridges.

Root diseases were the most damaging tree diseases in Montana. Diseases caused by the five pathogens associated with most root disease problems were Armillaria root rot, brown cubical root and butt rot, laminated root rot, Annosus root rot, and black stain root disease. Hypodermella needle blight caused heavy defoliation of western larch near Swan Lake and on the Kootenai National Forest. Naemacyclus needlecast damaged Scotch pine Christmas trees in Big Fork. White pine blister rust remained a severe handicap in managing western white pine throughout northwestern Montana. Comandra blister rust cankers were abundant on parts of the Gallatin and Beaverhead National Forests. Impacts from dwarf mistletoes are gradually decreasing as silvicultural prescriptions are designed with them in mind and as special suppression projects are completed. However, they still cause major growth loss. Mistletoe suppression projects were completed on 1,639 acres of the

Bitterroot, Flathead, and Lolo National Forests. Grey mold was an important disease of containerized conifer seedlings at several private nurseries. Fusarium root disease was a problem of containerized conifer seedling production. Other notable diseases that occurred in tree nurseries in Montana included Sirococcus tip blight, western gall rust, and damping-off.

INSECTS

Bark Beetles

Mountain Pine Beetle

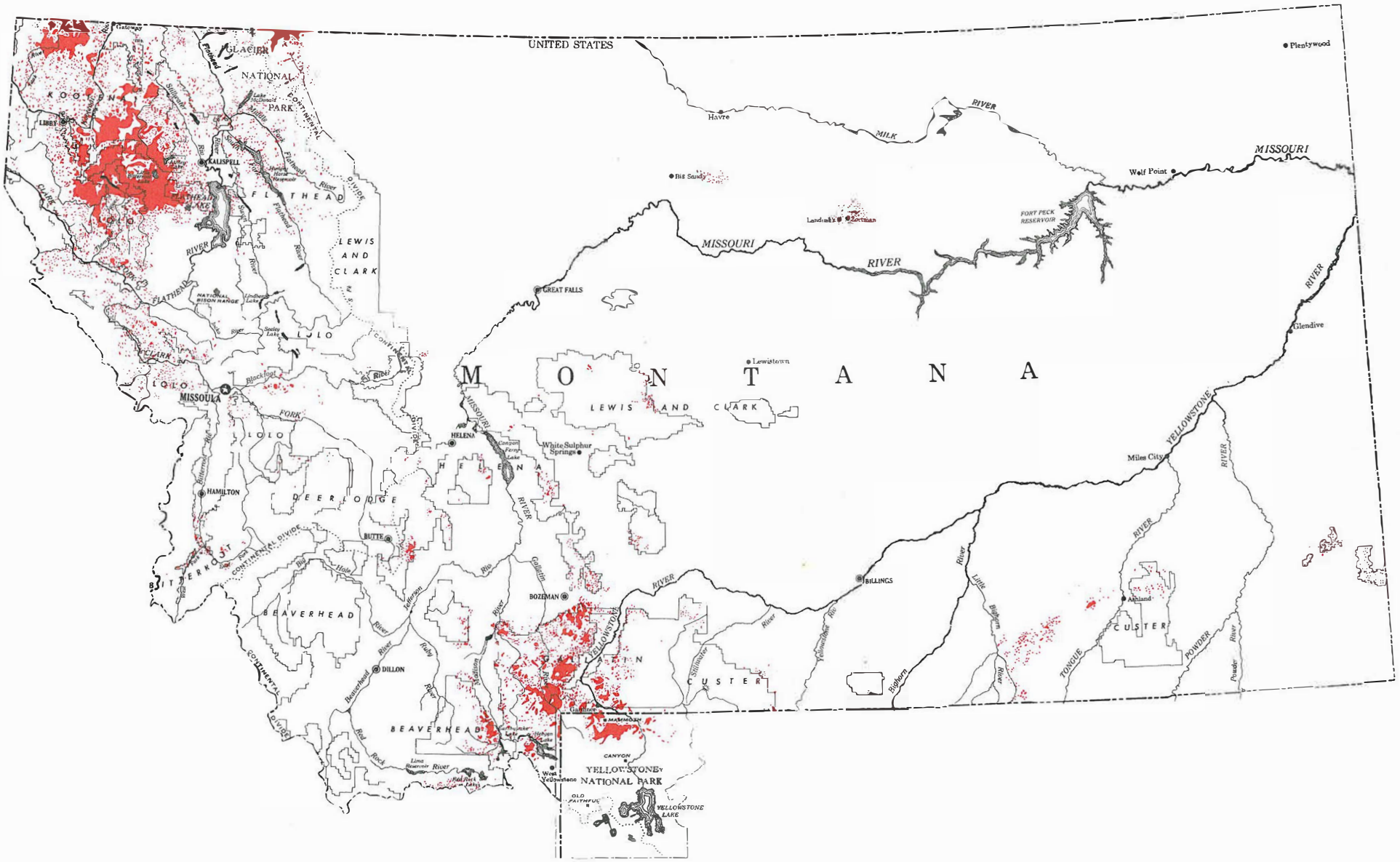
Mountain pine beetle was the most destructive forest insect on lands of all ownerships in Montana again in 1984. Significant epidemics persisted in lodgepole pine on the Beaverhead, Flathead, Gallatin, Kootenai, and Lolo reporting areas and in Glacier and Yellowstone National Parks (see map). Less severe outbreaks continued in other reporting areas. Infestations in ponderosa pine persisted on the Bitterroot, Flathead, Garnets, Kootenai, Lewis & Clark and the Lolo reporting areas and in the Crow, Flathead and Northern Cheyenne Indian Reservations. Total Federal acres of all host species infested decreased from 1,252,026 acres in 1983 to 852,301 acres in 1984 (Table 1). Total State and private acres of mountain pine beetle infestations on all host species increased significantly from 285,227 acres in 1983 to 450,833 acres in 1984 (Table 2). Most of this increase was noted on the Kootenai reporting area where the infestation in lodgepole pine went from 34,112 acres in 1983, to 224,311 acres in 1984. Acres of ponderosa pine on State and private lands on the same area increased from 960 acres in 1983 to 6,567 acres in 1984.

Beaverhead National Forest Reporting Area--The outbreak has decreased the past 2 years because most susceptible stands have been attacked. Most of the beetle activity was confined to the Centennial Mountains, west side of the Madison Range, and the east side of the Tobacco Root Mountains and Gravelly Range.

Bitterroot National Forest Reporting Area--Mountain pine beetle activity on Federal lands remained about the same as in 1983 except there was some decrease in the number of acres of ponderosa pine attacked. Infestations on State and private lands were present only in ponderosa pine stands and the acres affected decreased from 4,165 in 1983 to 2,413 in 1984 (Table 2). Infestations persisted in the Eightmile Creek drainage near Florence between Darby and Conner, and in the Sula State Forest.

Custer National Forest Reporting Area--On Federal lands there was an increase in beetle activity in lodgepole pine and a decrease in whitebark pine attacks. Ponderosa pine acres were about the same as 1983. Acres of State and private ownership of all host species affected increased from 30 in 1983, to 749 in 1984. Lodgepole and whitebark pines affected were mainly west of Red Lodge.

Deerlodge National Forest Reporting Area--There was a sharp acreage increase of mountain pine beetle activity on National Forest lands on this reporting area. The increase was from 700 acres in 1983, to 6,548 acres in 1984. It has the potential for a continuing epidemic. A total of 245 acres of lodgepole pine on State and private lands was affected in 1984. There were no attacks reported on these ownerships in 1983.



Areas of mountain pine beetle infestations in Montana and Yellowstone National Park, 1984

Table 1.—Acres of mountain pine beetle infestation on Federal lands in Montana and Yellowstone National Park, 1983 and 1984.

Ownership	1983				1984			
	LPP[1]	WBP	PP	WWP	LPP	WBP	PP	WWP
Beaverhead NF	59,112	2,922	–	–	27,448	3,160	–	–
Bitterroot NF	3,716	–	2,547	–	4,006	–	1,666	–
Custer NF	908	1,093	975	–	4	229	1,158	–
Deerlodge NF	700	–	–	–	6,548	–	–	–
Flathead NF	41,660	12,626	–	2,423	76,091	1,006	15	1,234
Gallatin NF	168,847	19,800	30	–	151,160	8,301	–	–
Helena NF	263	–	–	–	2,043	–	91	–
Kootenai NF	102,189	930	1,360	–	372,966	303	3,411	659
Lewis & Clark NF	30	–	1,078	–	96	100	864	–
Lolo NF	39,201	4,161	54	250	39,359	2,309	2,120	423
Glacier NP	27,041	83	–	200	17,620	5	–	520
Yellowstone NP	689,291	34,440	–	–	105,564	934	–	–
Blackfeet IR	5,400	–	–	–	8,721	–	–	–
Crow IR	–	–	4,300	–	–	–	1,247	–
Flathead IR	4,100	–	1,825	–	915	–	1,223	–
Fort Belknap IR	1,986	–	30	–	1,325	–	8	–
N. Cheyenne IR	–	–	1,760	–	–	–	3,313	–
Rocky Boy's IR	800	–	30	–	336	–	–	–
BLM	13,839	–	26	–	3,364	436	–	–
TOTALS								
National Forests	416,626	41,532	6,044	2,673	679,721	15,408	9,325	2,316
National Parks	716,332	34,523	–	200	123,184	939	–	520
Indian Reservations	12,286	–	7,945	–	11,297	–	5,791	–
BLM	13,839	–	26	–	3,364	436	–	–
All Federal	1,159 083	76,055	14,015	2,873	817,566	16,783	15,116	2,836

[1]LPP = lodgepole pine; WBP = whitebark pine; PP = ponderosa pine; WWP = western white pine.

Table 2.--Acres of mountain pine beetle infestation on State and private lands in Montana, 1983 and 1984.

Reporting area	1983				1984			
	LPP	WBP	PP	WWP	LPP	WBP	PP	WWP
Beaverhead	7,281	1,280	-	-	7,519	112	-	-
Bitterroot	-	-	4,165	-	-	-	2,413	-
Custer	-	-	30	-	205	272	272	-
Deerlodge	-	-	-	-	245	-	-	-
Flathead	93,051	-	3,971	30	94,033	-	13,567	13
Gallatin	64,790	12,306	-	-	63,648	5,110	-	-
Garnets	-	-	4,215	-	11	-	3,343	-
Helena	244	-	20	-	841	-	176	-
Kootenai	34,112	110	960	-	224,311	-	6,567	14
Lewis & Clark	40	-	568	-	183	-	432	-
Lolo	30,742	320	4,145	250	8,853	10	1,897	85
Stillwater SF	3,619	1,542	-	2,330	1,214	121	1	-
Swan SF	-	-	-	30	2,730	-	461	-
Thompson R. SF	15,096	-	-	-	11,524	-	649	1
Totals	248,955	15,558	18,074	2,640	415,317	5,625	29,778	113

Flathead National Forest Reporting Area--An increase of affected Federal acres of lodgepole pine was noted in 1984. Infestations on State and private lands in lodgepole pine stayed approximately the same as 1983, but ponderosa pine acres affected increased from 3,971 in 1983, to 13,567 in 1984. Most of the activity in lodgepole pine on State and private ownerships was in the area of Little Bitterroot and McGregor Lakes southwest of Kalispell. Ponderosa pines affected by the beetle on State and private lands were mainly in the Little Meadow Creek drainage east of Hubbart Reservoir.

Gallatin National Forest Reporting Area--There was a slight decline in acres of lodgepole pine mortality caused by mountain pine beetle on Federal lands, but an increase in whitebark pine stands. As the infestation has progressed, more mortality has occurred at the higher elevations. Acres of lodgepole pine affected on State and private ownerships stayed about the same in 1984, but whitebark pine acres decreased from 12,306 in 1983, to 5,110 in 1984.

Garnets Reporting Area--Acres of State and private ponderosa pine infested by mountain pine beetle in the Garnet Mountains decreased to 3,343 in 1984 compared to 4,215 in 1983. Most of the activity centered around Norman Creek, Potomac, and Greenough in the Blackfoot River drainage.

Helena National Forest Reporting Area--A sharp increase in acres of beetle-caused lodgepole pine mortality occurred on National Forest lands. Acres of lodgepole pine affected on State and private lands also increased. Some scattered mortality in ponderosa pine stands was also observed.

Kootenai National Forest Reporting Area--There was a marked increase in Federally owned infested lodgepole pine acres in 1984. A dramatic increase in the number of acres of lodgepole pine of State and private ownership that were infested by the beetle was also observed. This went from 34,112 acres in 1983, to 224,311 in 1984. Acres of ponderosa pine on State and private lands that were affected also increased dramatically from 960 in 1983 to 6,567 in 1984. Major damage occurred in Pleasant Valley and the Fisher River drainage.

Lewis & Clark National Forest Reporting Area--Not much change in the number of acres infested was noticed for this area. Most of the beetle-caused mortality has occurred in ponderosa pine stands of Federal, State, and private ownership.

Lolo National Forest Reporting Area--Beetle activity remained about the same on National Forest ownership in 1984. Infestations on State and private lands in this reporting area decreased from 30,742 acres of lodgepole pine in 1983 to 8,853 acres in 1984. Acres of ponderosa pine affected also decreased from 4,145 in 1983 to 1,897 in 1984. Mountain pine beetle epidemics on State and private lands still persist in the Thompson River drainage, Ninemile Creek drainage and along the Clark Fork west of Missoula.

Stillwater State Forest Reporting Area--Infestations in State and privately owned lodgepole, whitebark, and western white pines declined from 7,491 acres in 1983, to 1,336 acres in 1984. Some beetle activity persisted on the west side of the Whitefish Range west of Whitefish Lake, lower Swift Creek and Fitzsimmons Creek drainages, and near the American Timber Mill at Olney.

Swan State Forest Reporting Area--Beetle activity on State and private lands increased to 3,191 infested acres in 1984 from only 30 acres in 1983. Most of the infestation was in lodgepole pine north of Swan Lake and east of Echo Lake.

Thompson River State Forest Reporting Area--State and private acres of beetle infestation decreased from 15,096 in 1983, to 12,174 in 1984. Most beetle activity was in the Thompson River drainage in lodgepole pine stands.

Glacier National Park--There has been a decline in beetle-infested lodgepole pine acres in Glacier National Park. Most of the 1984 activity was on the east side of the Park adjacent to the Blackfeet Indian Reservation.

Yellowstone National Park--There was a dramatic drop in lodgepole pine affected in 1984. Most of the susceptible stands have been killed.

Blackfeet Indian Reservation--A slight increase in acres of lodgepole pine mortality was noted in 1984.

Crow Indian Reservation--Ponderosa pine mortality increased in 1984.

Flathead Indian Reservation--There was a decrease in the number of acres of lodgepole pine mortality from mountain pine beetle in 1984. Acres of ponderosa pine affected remained about the same.

Fort Belknap Indian Reservation--Acres of lodgepole pine infested decreased from 1,986 in 1983, to 1,325 in 1984.

Northern Cheyenne Indian Reservation--An increase in ponderosa pine acres with beetle mortality was observed in 1984.

Rocky Boy's Indian Reservation--There was a slight decrease in acres of lodgepole pine mortality noted in 1984.

Bureau of Land Management--The number of acres of lodgpeole pine mortality due to mountain pine beetle dropped on BLM land throughout the State.

Mountain Pine Beetle Projects--Areas were established in 1984 in second-growth ponderosa pine stands on the Crow and Northern Cheyenne Indian Reservations to demonstrate the effectiveness of basal area cutting in reducing tree killing by mountain pine beetle. A beetle epidemic has existed on the eastern portion of the Crow Indian Reservation for approximately 12 years. Within the last few years the outbreak has spread to the western half of the Northern Cheyenne Indian Reservation.

Eight 10-acre blocks were surveyed on each Reservation in areas where beetle populations were still low but threatened to expand into susceptible stands. Stands in which treatment blocks were established had average diameters that ranged from 6 to 10 inches and averaged 150 square feet/acre basal area.

The planned treatments will reduce residual basal area to 50, 65, and 80 square feet/acre. One treatment will be "no cutting" (control). Each treatment will be replicated twice on each Reservation. Logging of the blocks is expected to be completed prior to the 1985 beetle flight.

Following cutting, the blocks will be monitored yearly for 5 years, then at 5-year intervals to determine the effect of treatment on beetle populations. The intent of the study is to develop guidelines for managing second-growth ponderosa pine stands in eastern Montana to reduce mountain pine beetle losses.

Spruce Beetle

Infestation levels of spruce beetle decreased in 1984 for the first time since the current outbreak began in 1981. Acres of Federal lands infested by spruce beetle declined to 16,355 in 1984 from 28,602 in 1983 (Table 3). Acres of State and private lands infested decreased markedly from 7,091 in 1983, to 368 in 1984. These decreases were the result of aggressive programs of salvage logging, logging high-risk stands, and the use of trap trees to reduce beetle populations. Also most of the susceptible stands with large diameter spruce trees have been decimated by the beetles. The outbreak should continue to decline in 1985.

Douglas-fir Beetle

Damage by Douglas-fir beetle on all ownerships continued to increase in 1984. Federal lands infested in 1984 totaled 16,792 acres, compared to 6,747 acres in 1983 (Table 3). In 1984, there were 1,208 acres of State and private lands infested, up from 143 acres in 1983 (Table 4). The increase in Douglas-fir beetle activity has been due largely to the continued heavy spruce budworm defoliation of Douglas-fir stands in several areas, which has made these stands more susceptible to the beetle. Continued root rot infections in mature and overmature stands of Douglas-fir have also contributed to the increase in beetle activity.

Western Balsam Bark Beetle

Damage from western balsam bark beetle continued to be chronic in stands of subalpine fir in Montana in 1984. Damage on Federal lands increased from 3,401 acres in 1983, to 11,387 acres in 1984 (Table 3). Damage to State and private ownerships also increased from 141 acres in 1983, to 1,976 acres in 1984 (Table 4).

Pine Engraver

Tree killing from pine engraver declined considerably in 1984. The only significnt damage was 663 acres of infestation in ponderosa pine on the Northern Cheyenne Indian Reservation (Table 3). A total of 120 acres of State and private lands was infested in the Thompson River drainage (Table 4).

Other Bark Beetles

No major damage from other bark beetles was noted in 1984. Fir engraver infested 25 acres of State and private lands on the Swan State Forest Reporting Area (Table 4). Douglas-fir engraver infested Federal lands on 220 acres of the Flathead National Forest and 30 acres of the Lolo National Forest (Table 3).

Table 3.--Acres of bark beetle infestations (other than mountain pine beetle) on Federal lands in Montana and Yellowstone National Park, 1984.

Ownership	Douglas-fir beetle	Douglas-fir engraver	Western balsam bark beetle	Pine engraver	Spruce beetle
Beaverhead NF	-	-	1,511	-	158
Bitterroot NF	6,539	-	64	-	-
Custer NF	-	-	61	1	-
Deerlodge NF	26	-	-	-	-
Flathead NF	1,672	220	3,568	-	11,071
Gallatin NF	-	-	2,684	5	63
Helena NF	-	-	200	-	-
Kootenai NF	461	-	1,144	-	442
Lewis & Clark NF	-	-	82	-	14
Lolo NF	1,921	30	66	-	-
Glacier NP	1,888	1	166	20	4,607
Yellowstone NP	4,179	-	125	-	-
Blackfeet IR	-	-	4	-	-
Flathead IR	105	-	-	-	-
Ft. Belknap IR	1	-	-	-	-
N. Cheyenne IR	-	-	-	663	-
BLM	-	-	1,712	-	-
TOTAL	16,792	251	11,387	689	16,355

Table 4.--Acres of bark beetle infestations (other than mountain pine beetle) on State and private lands in Montana, 1984.

Ownership	Douglas-fir beetle	Douglas-fir engraver	Western balsam bark beetle	Pine engraver	Spruce beetle
Beaverhead NF	-	-	902	-	-
Bitterroot NF	52	-	-	-	-
Custer NF	604	-	110	-	-
Deerlodge NF	66	-	-	-	-
Flathead NF	24	-	26	-	234
Gallatin NF	-	-	687	-	-
Garnets	29	-	-	-	-
Helena	-	-	231	-	-
Kootenai	-	-	-	-	70
Lewis & Clark	-	-	-	-	-
Lolo	381	-	20	-	60
Stillwater SF	1	-	-	-	4
Swan SF	10	25	-	-	-
Thompson River SF	41	-	-	120	-
TOTALS	1,208	25	1,976	120	368
TOTAL	16,792	251	11,387	689	16,355

Defoliators

Western Spruce Budworm

There was a slight decrease in acres with visible defoliation caused by western spruce budworm in 1984 on all ownerships in Montana (see map). In 1983, there were approximately 2.6 million acres and in 1984, a total of just over 2.3 million acres were defoliated (Table 5). Most of the decline was observed in the western portion of the State. Table 6 shows total acres of defoliation on all ownerships each year from 1960 to 1984.

The spruce budworm silvicultural demonstration area on the Gallatin National Forest was evaluated in 1984 for larval populations. Population levels were

light and about the same for all blocks including the uncut check block. Population density levels on small trees less than 2 feet in height were very low when compared to larger trees.

Douglas-fir Tussock Moth

Adult male moth catches declined substantially on most of the 33 permanent pheromone trapping plots in western Montana in 1984. Average number of moths per trap ranged from none at Hellroaring Creek near Polson to 76.6 at Pistol Creek near St. Ignatius. Out of eight plots that had more than 25 moths per trap in 1983, only two had more than 25 moths per trap in 1984.

The only Montana tussock moth defoliation detected in 1984 was on a yard tree in Missoula and on a small group of Douglas-fir in a yard near Somers. Eight plots that had more than 25 male moths per pheromone-baited trap in 1983 were sampled in June 1984 for early instar larvae. Larval populations were classified as intermediate level at Kerr Dam and Somers #1; and low level at the remainder (Somers #2, Frenchtown T, Frenchtown J, Corral Creek, Butler Creek, Albert Creek).

Larch Casebearer

For the second year, visible larch casebearer defoliation increased in chronically infested areas in the Flathead, Kootenai, and Lolo National Forest areas, and on the Flathead Indian Reservation. Some of the heaviest feeding damage was detected along west-facing slopes of the Mission Mountains where larch budmoth damage also occurred.

Larch Budmoth

In 1983, infestation centers of larch budmoth appeared for the first time since 1967 on the Flathead National Forest, Glacier National Park, and the Flathead Indian Reservation. These centers were not as obvious in 1984. Most larch budmoth damage was mixed with larch casebearer defoliation, especially along the Mission Mountains.

Pine Needle Sheathminer

Defoliation by pine needle sheathminer was widespread over Montana during 1984. For the fourth year, damage was noticeable in ponderosa pine stands on the southern portion of the Helena National Forest. On the Gallatin National Forest, defoliation was again detected in several lodgepole pine stands north of Bozeman, and was heavy in several thousand acres of lodgepole south of Bozeman. Ponderosa pine stands on the Flathead Indian Reservation and in the Bitterroot Valley sustained various degrees of defoliation.

Pine Butterfly

Populations of adult butterflies decreased in 1984 in the ponderosa pine stands of western Montana. No visible defoliation was detected.

Table 5.--Acres of aerially visible western spruce budworm defoliation on all ownerships in Montana and Yellowstone National Park, 1983 and 1984.

	Total acres		1984 acres by ownership				
	1983	1984	National Forest	National Park	BIA	BLM	State & private
Beaverhead	575,789	345,650	200,671	-	-	72,971	72,008
Bitterroot	195,732	20,959	19,651	-	-	-	1,308
Custer	68,780	94,734	38,841	-	-	5,077	51,816
Deerlodge	205,833	322,467	173,907	-	-	38,907	109,653
Gallatin	632,877	574,165	311,555	-	-	-	262,610
Helena	366,234	581,372	319,297	-	-	32,717	229,358
Lewis & Clark	180,684	206,104	141,652	-	-	3,062	61,390
Lolo	227,215	63,651	44,459	-	-	120	19,072
Garnets	81,410	23,229	-	-	-	4,405	18,824
Flathead IR	7,799	1,750	-	-	1,750	-	-
Crow IR	0	14,398	-	-	14,398	-	-
Yellowstone NP	44,221	52,283	-	52,283	-	-	-
TOTAL	2,586,574	2,301,762	1,250,033	52,283	16,148	157,259	826,039

Table 6.--Acres of aerially visible western spruce budworm defoliation on all ownerships in Montana and Yellowstone National Park, since 1960.

Year	Acres	1973	Acres
1960	2,496,890	1973	1,666,900
1961	2,808,400	1974	2,161,309
1962	2,888,990	1975	2,955,522
1963	1,877,320	1976	2,496,274
1964	1,918,180	1977	2,974,725
1965	2,578,890	1978	2,395,431
1966[1]	795,130	1979	2,195,897
1967	1,762,610	1980	848,342
1968	2,852,220	1981	894,713
1969	2,531,430	1982	2,210,200
1970	1,805,800	1983	2,545,326
1971	1,286,720	1984	2,301,762
1972	2,653,685		

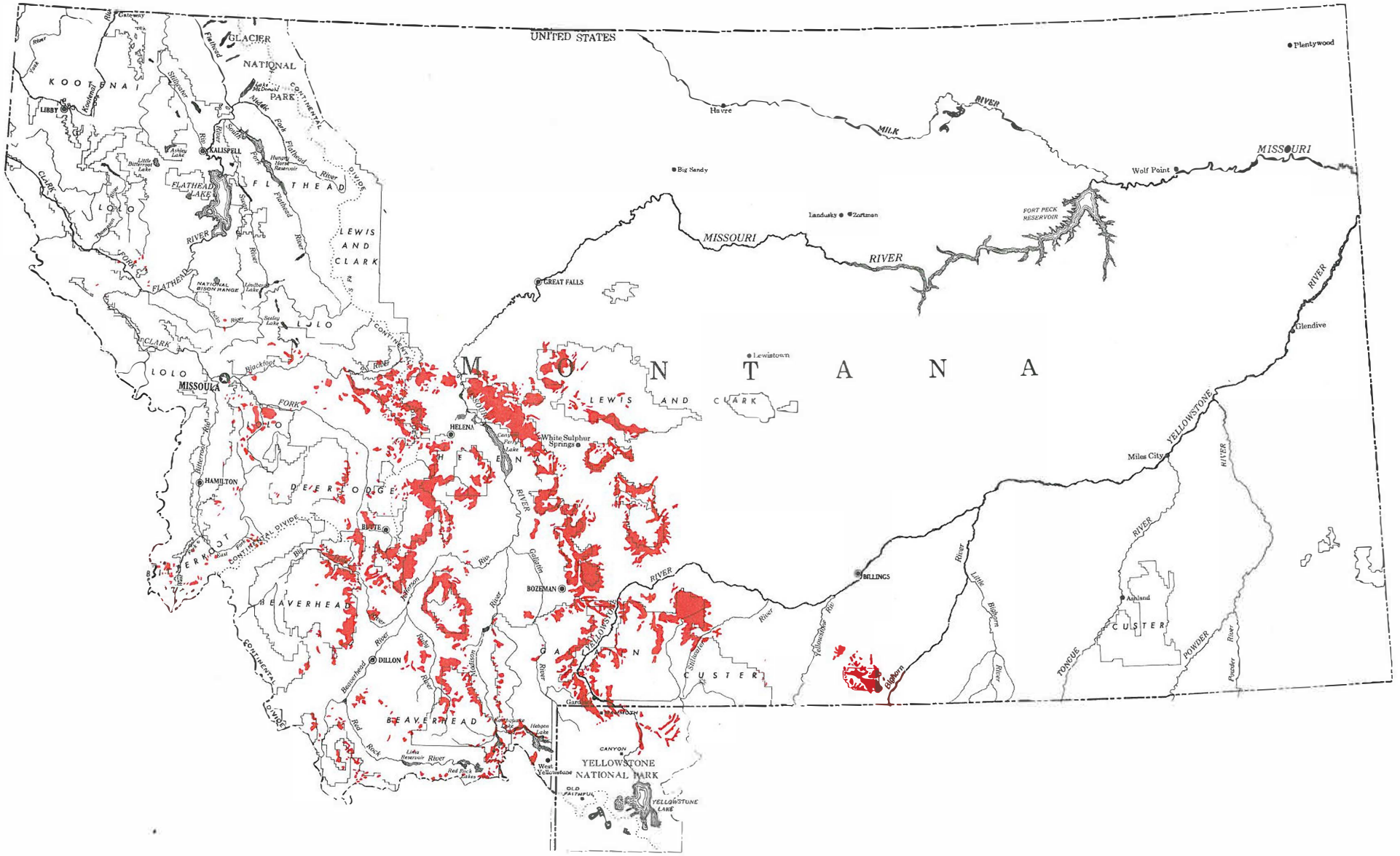
[1]Bitterroot, Gallatin, and Lewis & Clark National Forest areas not surveyed for budworm in 1966.

Gypsy Moth

Because gypsy moth was discovered for the first time in Montana during 1983, the trapping program was intensified in 1984. The USDA Forest Service distributed 300 pheromone traps to Federal agencies and the Montana Department of State Lands. The traps were used to check 60 campgrounds for male moths. The State, in cooperation with USDA APHIS, had a similar trapping program on State and private lands. Only one male moth was caught in 1984 in a trap located at Apgar Campground in Glacier National Park. This was the same campground where the only moth in 1983 was trapped.

Western Pine Shoot Borer

Western pine shoot borer remained a chronic pest in ponderosa pine stands in western Montana. Control tests using pheromone to disrupt mating were continued for the second year. Two blends (Natural and Phillips) of western



Western spruce budworm defoliation visible from the air in Montana and Yellowstone National Park, 1984

pine shoot borer pheromone, formulated as Hercon Luretape, were applied to ponderosa pine plantations at Lubrecht Experimental Forest and Condon, and to a ponderosa pine seed orchard at the State Tree Nursery in Missoula. The number of infested terminals was decreased by as much as 37 percent in one area (Condon). The tests will continue in 1985.

Fall Webworm

The outbreak collapsed during 1984.

Pine Bark Aphid

Aphid populations on Scotch pine Christmas tree plantations in northwest Montana were at low levels in 1984. Little damage was reported.

Western Tussock Moth

An outbreak of western tussock moth in curlleaf mahogany was detected on BLM lands about 4 miles northwest of Twin Bridges. About 130 acres of the mahogany were severely defoliated during the summer. Egg masses of the moth were abundant in the area in October. The egg masses are currently being checked for virus infection. This may be the first recorded outbreak of this moth in mahogany in Montana.

ENTOMOLOGY FIELD TRIP

In September, forest entomologists and managers from throughout the western United States and Canada were invited to accompany Region 1, USDA Forest Service staff on a field trip to look at new and developing techniques in pest management. In a 1-week tour of selected sites in western Montana and northern Idaho, the group observed trap trees used for spruce beetle control, the use of semiochemicals in both baits and traps for mountain pine beetle management, pine-oil used to prevent mountain pine beetle attacks on lodgepole pine, the use of disruptive pheromones to prevent losses to western pine shoot borer in ponderosa pine plantations, new developments in the silvicultural control of western spruce budworm, the use of chemical implants to prevent seed losses to western spruce budworm, results of an operational project using MCH to prevent Douglas-fir beetle population buildups in blowdown, a newly recorded balsam woolly adelgid infestation in Idaho, and current management strategies to prevent losses to seed and cone insects in seed orchards. Twenty-two were in attendance and all agreed the introduction to and the discussion of these techniques and philosophies were valuable.

EGG MASS COUNTER

Cooperative Forestry and Pest Management, in cooperation with MEDC, conducted the first performance evaluation of an automatic spruce budworm egg mass detector. The counter works on the principle that recently hatched budworm egg masses fluoresce. A sensor in the machine is calibrated to the wave lengths of egg mass fluorescence. Foliage with budworm egg masses from fir tree species from the Northeast, Northwest, and Southwest was examined with the machine. Mechanical operation of the counter was very reliable. An evaluation of machine counts and visual counts will be used to assess precision of the counter. Further development depends on overall efficiency and accuracy of the counter compared to conventional hand examination methods.

DISEASES

Root Diseases

Root disease infested sites are common in Montana forests. These diseases often intensify with stand management and pose a challenge to the forest manager. Root diseases are usually site problems rather than tree or stand problems. Root diseases tend to persist not only for the life of the present stand, but also into the next rotation and beyond.

Diseases caused by the five pathogens associated with most root disease problems are Armillaria root rot, brown cubical root and butt rot, laminated root rot, annosus root rot, and black stain root disease. The first three of these are the most prevalent and are associated with the most damage (see map). They frequently occur together or in combination with other fungi and/or bark beetles. Trees weakened by root disease are easily killed by bark beetles.

Principal hosts of the three most prevalent root pathogens are Douglas-fir, subalpine fir, and grand fir. Other less susceptible hosts are western hemlock, Engelmann spruce, subalpine fir, western white pine and other pines, western larch, and western redcedar.

Most of the root disease problems in Montana are on the Flathead, Kootenai, and Lolo National Forest areas, where about 25 percent of all endemic tree mortality is associated with root disease.

Some specific observations made in 1984 and reports on special root disease projects follow.

A project to evaluate effects of thinning on root disease development within 10- to 30-year-old stands was recently initiated. Sixty plots in 11 stands on the Flathead, Kootenai, and Lolo National Forests have been established. Root disease development in thinned and unthinned plots will be monitored for several years.

Armillaria root rot and brown cubical root and butt rot caused a proposed overstory removal and thinning to be deferred for an infected Douglas-fir stand on the Flathead Indian Reservation. Another Armillaria-infected stand on the Reservation was evaluated. The disease had caused various levels of mortality in stands ranging from nearly pure Douglas-fir (most damaged) to well mixed with pines and western larch (least damaged).

A predominantly Douglas-fir stand on State land in the Plains area had a number of root pathogens causing damage. Armillaria root rot was most prevalent. Brown cubical root and butt rot was also common. Annosus root rot occurred in a mortality pocket, and black stain root disease had killed groups of saplings. The scheduled thinning will be deferred.

A pocket of Douglas-fir mortality on State-owned land bordering the Swan Highway was caused by brown cubical root and butt rot. Also in the stand were mortality centers caused by Armillaria root rot. Larch will be favored in the Armillaria disease centers.

A modest amount of brown cubical root and butt rot on the Darby Ranger Distict, Bitterroot National Forest, was judged not to preclude commercial thinning to leave the younger Douglas-fir.

Brown cubical root and butt rot was found in extensive areas of the Magpie drainage of the Townsend Ranger District, Helena National Forest. The disease had caused considerable mortality and windthrow in spots. Established Douglas-fir regeneration was extensively infected and unsuitable for management.

A large Armillaria root disease center in a predominantely Douglas-fir stand was reported on the Townsend Ranger District in 1984. This may necessitate conversion to lodgepole pine in that part of the stand.

Two candidate seed production areas were evaluated--one on the Fortine Ranger District, Kootenai National Forest, and one on the Superior Ranger District, Lolo National Forest. Both stands were damaged by Armillaria root disease. The Fortine Ranger District stand had scattered and small-pocket mortality primarily in Douglas-fir. Lodgepole pine and Engelmann spruce were also affected to some degree. Thinning required to develop the area for seed production would likely cause mortality rates of residual Douglas-fir to increase. Armillaria root disease was most severe in Douglas-fir in the Superior Ranger District stand. Here the disease appeared to be restricted to the lower half of the stand. Selection of western larch, ponderosa pine, or western white pine leave trees in this infested lower half should alleviate most of the problem.

An established, predominately Douglas-fir seed production area on the Lochsa Ranger District, Clearwater National Forest, had considerable windthrow following thinning. The root systems of windthrown trees were extensively decayed. Armillaria fans were present at the root crowns and Fomes annosus was cultured from laminated decay of major roots.

Armillaria root rot and Annosus root rot were found to be variously affecting stands on the Ninemile Ranger District, Lolo National Forest which have had no cutting history. In some stands virtually every acre had scattered mortality and live trees with advanced infections while other stands in the drainage had little mortality of dominants or codominants. A stand in another drainage was examined where a large Annosus root rot/Armillaria root rot combined disease center had killed nearly all overstory Douglas-fir and continued to kill seedlings.

Foliage Diseases

Hypodermella needle blight was reported to have caused heavy defoliation of western larch in some stands near Swan Lake, and on Federal lands in the Kootenai National Forest.

The most damaging pest of Scots pine Christmas trees in the Big Fork area was Naemacyclus needlecast. Results of the 1984 survey showed this fungus to be present at varying levels in all plantations sampled. Lodgepole pine needlecast and red band needle blight (on Austrian pine) also caused damage.

Canker Diseases

White Pine Blister Rust

White pine blister rust remained a severe handicap in managing western white pine throughout northwestern Montana. The disease has been managed over the past few years by regenerating harvested stands with resistant white pine stock and mixtures of other species. A guide for managing western white pine in the presence of blister rust is being compiled by Region 1 Forest Pest Management, Intermountain Forest and Range Experiment Station, and the Clearwater National Forest. In this guide, infection levels and prevalence of Ribes will be used to assess site hazards. The guide will use computer models to predict rates of white pine survival in sites with different hazards.

Comandra Blister Rust

Comandra blister rust cankers were abundant on lodgepole pine on the Gallatin National Forest south of Bozeman. Infection levels remained high on the Dillon and Madison Ranger Districts, Beaverhead National Forest.

Dwarf Mistletoes

Impacts from dwarf mistletoes are gradually decreasing as silvicultural prescriptions are designed with them in mind and as special suppression projects are completed. Suppression projects were completed on 243 acres of the Bitterroot National Forest, 352 acres of the Flathead National Forest, and 1,044 acres of the Lolo National Forest. In addition, presuppression surveys were conducted on 7,035 acres of the Lolo National Forest. One postsuppression evaluation was made on the Bitterroot National Forest. Evaluations for potential suppression projects were made on the Darby, Sula, and West Fork Ranger Districts of the Bitterroot National Forest, the Swan Lake Ranger District of the Flathead National Forest, and the Bozeman Ranger District of the Gallatin National Forest. All of these stands qualified for pest management funding. The lodgepole pine dwarf mistletoe spread and intensification plots on the Gallatin National Forest were also examined; data analysis indicates that very little impact on growth occurs in young (<30 years old) managed sapling and pole stands.

Nursery Diseases

Grey Mold

Grey mold was an important disease of containerized conifer seedlings at several private nurseries in Montana. The disease was usually controlled adequately by application of fungicides and by sanitizing infected greenhouses.

Fusarium Root Disease

This disease was a problem of containerized conifer seedling production. Significant losses occurred at the Ronan Bureau of Indian Affairs Nursery and at a private nursery in Kalispell. The pathogen was likely seedborne or infection occurred from previous crop debris. Sanitation and fungicides were used to control this disease.

Miscellaneous Diseases

Other notable diseases that occurred within nurseries in Montana included Sirococcus tip blight, western gall rust and damping-off root diseases caused by Fusarium and Pythium. These diseases were confined to bareroot stock. A serious storage mold problem occurred on several Ranger Districts of the Flathead and Kootenai National Forests. The mold fungus caused a black webbing in bareroot Engelmann spruce which were lifted in the fall and stored at the Ranger Districts during the winter. Losses were significant and entire boxes of seedlings had to be discarded.

INSECT AND DISEASE SURVEY ON TEST PLANTATIONS

The Inland Empire Cooperative is a group of Federal, State, and private agencies dedicated to selection and propagation of superior trees that produce more and better seed which will eventually result in improved planting stock. Members have pooled their resources and established test plantings, seed orchards, and seed production areas. Several test plantings were visited by entomologists and pathologists in 1984 to determine the nature and extent of insect and disease problems.

Progeny Test Plantings

Condon Ponderosa Pine (Flathead National Forest)

About one-half of the trees examined were infested by western pine shoot borer in March. A treatment with a synthetic shoot borer pheromone in the spring reduced infestation to about 16 percent of the trees by fall.

Condon Western Larch (Flathead National Forest)

Significant damage noted was frost heaving, but some Hypodermella needle blight was also present. The trees are also still experiencing heavy vegetative competition.

Condon Lodgepole Pine (Flathead National Forest)

Some stunting of trees was noted, but the cause was not determined. Only a few trees had lodgepole pine needlecast.

Cellar-Ogilvie Lodgepole Pine (Helena National Forest)

No significant problems were noted.

Long Gulch Lodgepole Pine (Helena National Forest)

No significant problems were noted.

Wet Park Lodgepole Pine (Lewis & Clark National Forest)

About 12 percent of the trees were missing or dead from unknown causes.

Johnson Canyon Lodgepole Pine (Gallatin National Forest)

A few trees had Lophodermella needlecast. About 43 percent of the trees were missing or dead, probably from damage by ground squirrels.

Horse Butte Lodgepole Pine (Gallatin National Forest)

Only about 25 percent of the original stock had survived. About 10 percent of the remaining trees had been damaged by rodents, probably ground squirrels.

DIRECTORY OF PERSONNEL

Montana Department of State Lands
Forestry Division
2705 Spurgin Road
Missoula, Montana 59801 Phone: (406) 728-4300

Gary G. Brown:	State Forester
Roger E. Bergmeier:	Chief, Assistance Bureau
Steve Kohler:	Supervisor, Forest Insect and Disease Section

USDA Forest Service, Northern Region (1)
Federal Building
P.O. Box 7669 Phone: (406) 329-3280
Missoula, Montana 59807 FTS: 585-3280

John H. Thompson:	Staff Director, Cooperative Forestry & Pest Management
Robert G. Eder:	Computer Programer/Analyst
Rene M. Mangin:	Toxicologist/Pesticide Coordinator
James W. Byler:	Pathology Group Leader
Oscar J. Dooling:	Forest Pathologist
Susan K. Hagle:	Forest Pathologist
Robert L. James:	Forest Pathologist
Lionel D. Hall:	Biological Technician
Carma J. Gilligan:	Biological Laboratory Technician
Jerald E. Dewey:	Entomology Group Leader
Mark D. McGregor:	Forest Entomologist
Kenneth E. Gibson:	Forest Entomologist
Wayne E. Bousfield:	Forest Entomologist
Scott Tunnock:	Forest Entomologist
Larry E. Stipe:	Forest Entomologist
Hubert E. Meyer:	Biological Technician
Robert D. Oakes	Biological Technician

COOPERATIVE TRAINING

The Montana Department of State Lands and USDA Forest Service, Northern Region, conduct training programs to assist field-going personnel and forest managers in detection, identification, and management of forest pests. Training sites are located at Kalispell, Missoula, Butte, and Bozeman. The training program is separated into two parts: a basic session in which field identification and life cycles of pests are stressed, and an advanced session where management alternatives are discussed. The basic session is designed for field-oriented personnel such as stand exam crews. The advanced session is for silviculturists and others involved in developing management prescriptions.

In 1984, basic sessions were held at Missoula and Bozeman. Advanced sessions were conducted at Butte and Kalispell. In 1985, a basic session will be held at Kalispell and an advanced session at Missoula.

In order for instructors to be effective and participants to benefit most, enrollment at each session is limited to 30. The basic sessions are 2 days with half the time spent indoors in a lecture format and the other half spent in field identification and discussion. The advanced sessions are 3 days with about one-third devoted to indoor lecture/discussion periods, and the remainder to field exercises.

COMMON AND SCIENTIFIC NAMES

Insects

Balsam woolly adelgid	*Adelges picea* (Ratzburg)
Douglas-fir beetle	*Dendroctonus pseudotsugae* Hopkins
Douglas-fir engraver	*Scolytus unispinosus* LeConte
Douglas-fir tussock moth	*Orgyia pseudotsugata* (McDunnough)
Fall webworm	*Hyphantria cunea* (Drury)
Fir engraver	*Scolytus ventralis* LeConte
Gypsy moth	*Lymantria dispar* (Linnaeus)
Larch budmoth	*Zieraphera improbana* (Walker)
Larch casebearer	*Coleophora laricella* (Hubner)
Mountain pine beetle	*Dendroctonus ponderosae* Hopkins
Pine bark aphid	*Pineus silvestris* Annand
Pine butterfly	*Neophasia menapia* (C. & R. Felder)
Pine engraver	*Ips pini* (Say)
Pine needle sheathminer	*Zelleria haimbachi* Busck
Spruce beetle	*Dendroctonus rufipennis* (Kirby)
Western balsam bark beetle	*Dryocoetes confusus* Swaine
Western pine shoot borer	*Eucosma sonomana* Kearfott
Western spruce budworm	*Choristoneura occidentalis* Freeman
Western tussock moth	*Orgyia cana* (Edwards)

Diseases

Annosus root disease	*Heterobasidion annosum* (Fr.) Bref.
Armillaria root disease	*Armillaria mellea* (Vah. ex. Fr.)
Black stain root disease	*Verticicladiella wageneri* Kend.
Brown cubical root and butt rot	*Phaeolus schweinitzii* (Fr.) Pat.
Comandra blister rust	*Cronartium comandrae* Peck.
Damping-off	*Fusarium* sp.; *Pythium* sp.
Dwarf mistletoes	*Arceuthobium* sp.
Fusarium root disease	*Fusarium oxysporum* Schlect.
Grey mold	*Botrytis cinerea* Pers. ex Fr.
Hypodermella needle blight	*Hypodermella laricis* Tub.
Laminated root rot	*Phellinus weirii* (Murr.) Gilb.
Lodgepole pine dwarf mistletoe	*Arceuthobium americanum* Nutt.: Engelm.
Lodgepole pine needlecast	*Lophodermella concolor* (Dearn.) Darker
Naemacyclus needlecast	*Naemacyclus niveus* (Per.: Fr.) Sacc.
Red band needle blight	*Scirrhia pini* Funk & A. K. Parker
Sirococcus tip blight	*Sirococcus strobilinus* Preuss.
Western gall rust	*Endocronartium harknessii* (J. P. Moore) Y. Hirat.
White pine blister rust	*Cronartium ribicola* Fish. ex Rabh.

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